Nanocomputing

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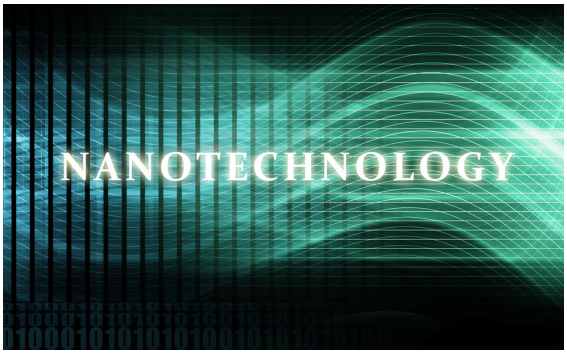
Advances in nanoscience and technology show great promise in the bottom-up development of smaller, faster, and reduced power computing systems. The mission of the nanocomputing group in AFRL is to lead the development of nano-dimensional architectures that deliver agile cyber in size, weight, and power-constrained systems for enhanced warfighting capabilities in air, space and cyberspace. Nanotechnology research in this group is focused on the development of crossbar computing architectures which utilize existing nanotechnologies including nanowires, coated nanoshells, memristors, and carbon nanotubes and are scalable to large arrays. There is a particular interest in the modeling and simulation of architectures that exploit the unique properties of these new and novel nanotechnologies. This includes development of nonlinear subcircuit models that accurately represent subcircuit performance with subsequent CMOS integration. Also of interest are the use of nanoelectronics and thermal management techniques using nanotechnologies in 3D computer architectures. The end of photolithography as the driver for Moore's Law is predicted within ten to twelve years. Six different emerging technologies, mostly nanoscale, are expected to complement and/or replace the current CMOS-based system integration paradigm. As nanotechnology is developing, there is a strong and growing need for DoD nanoscale systems scientists and engineers to exploit the SWAP and computer security advantages enabled through nanotechnology.



- AFRL Nanotechnology Program focuses on current and emerging nanoelectronics for information processing computing architectures
- The Nanotechnology Program leverages the $5B Albany Nanotech nanofabrication facility for prototype development of emerging nanocomputing architectures
- The Nanotechnology Program is exploring disruptive technologies, such as memristor nanoelectronics and nanowire based architectures, which will aid in the continued advancement of integrated circuit technology– not in straightforward transistor geometry scaling, but in several AF applications including SWAP, reconfigurable logic, secure computing and data storage
- The Nanotechnology Program is also exploring novel hybrid nanoelectronics incorporating state of the art CMOS technology with nanometer scale crossbar architectures and guided self assembly nanoelectronics fabrication techniques